

Environmental Science and Waste Technology Division Supporting Plan (2000-2003)

Vision:

Los Alamos National Laboratory maintains high standards in environmental stewardship and environmentally-centered ethics with all its endeavors and activities. The Environmental Science and Waste Technology Division (E-Division) is a global leader in developing environmental science and technology, which lead to innovative and effective solutions for nuclear materials and waste management. By understanding and modeling environmental systems, we also provide decision-makers with the tools and information to solve complex environmental problems.

Mission

E Division executes the Department of Energy's Environmental Management (DOE-EM) program activities for environmental restoration, legacy waste management, and development and implementation of technologies and methods for solving user-identified environmental problems.

E Division also consists of a technical capability focused on actinide geochemistry and applying non-destructive assay technology to characterize and certify waste planned for shipment to the Waste Isolation Pilot Plant.

The following describes the mission of each segment of the Division:

PROGRAMS

Environmental Restoration - The Project was established to clean up and restore sites contaminated during the past 50 years from Laboratory operations. The mission of the Project is to clean up the Laboratory and any residual off-site contamination in an efficient, risk-based, cost-effective manner.

Legacy Waste Management and Off-Site Source Recovery - The mission of this Program is to aggressively eliminate legacy waste while minimizing the amount of waste that must be managed. The Off-Site Source Recovery Program recovers and manages unwanted radioactive sealed sources for which no disposal options now exist.

Environmental Stewardship - The Environmental Stewardship Program minimizes the environmental impact of current, and future Laboratory and DOE operations. Its goal is a Laboratory that generates near-zero levels of radioactive, hazardous, and sanitary waste. The Program concentrates on the New Mexico Environment Department's Green Zia Environmental Excellence Program as a method of promoting continuous learning and improvement for pollution prevention at LANL.

Environmental Science and Technology - The Environmental Science and Technology Program is charged with developing timely, cost-effective, and comprehensive solutions by applying the Laboratory's science and technology base to DOE-EM's local and national environmental problems. The Program builds on the Laboratory's history of excellence in multidisciplinary problem solving through scientific and engineering innovation, progressive management, quality facilities, exceptional business practices, and effective demonstrations.

Nuclear Materials Technology Program - The Nuclear Materials Technology Program supports

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DOE-EM by providing technical support to the Nuclear Materials Stewardship Initiative and the implementation of activities relating to the Defense Nuclear Facilities Safety Board's recommendations regarding nuclear materials. Within this Program area, LANL is the Lead Laboratory for Plutonium. LANL is developing the technology bases for DOE Standards for safe long-term storage of nuclear materials, developing technologies for the treatment of materials to meet the standards, assembling and monitoring a shelf-life inventory that represents materials stored around the complex, and exploring the underlying science of nuclear material treatment and storage.

Environmental Work for Others - This Program includes Laboratory work for non- DOE customers including: Environmental Protection Agency, Department of Defense, Department of Agriculture, U.S. State Department, National Oceanic and Atmospheric Administration, U.S. Geological Survey, Department of the Interior, National Science Foundation, and international agencies. Primary Program areas include Green Chemistry and other pollution prevention science, natural resources management with a focus on water, nuclear waste science including repositories as well as hazardous and non-radioactive wastes.

Yucca Mountain Project - LANL provides science for the Yucca Mountain High-Level Waste Repository Project, which is located approximately 100 miles north of Las Vegas, Nevada. Efforts focus on the areas of site characterization and field-testing. In the site characterization area, work focuses on modeling transport of radionuclides through the mountain, mineralogy and petrology, geochemistry, and volcanism. For the field testing, LANL scientists and engineers perform numerous testing activities such as simulating the flow of radionuclides through the unsaturated zone of the mountain.

Rocky Flats - A team of scientists and engineers is stationed at Rocky Flats Environmental Technology Site near Denver, Colorado, to assist with closure of the former nuclear weapons production plant. The Rocky Flats team provides on-site technical support to the integrating management contractor, Kaiser-Hill, by applying LANL's expertise to closure needs. The team supports closure activities including nuclear materials processing and handling, waste management and shipping, nondestructive assay and nondestructive examination, and decontamination and decommissioning.

Carlsbad – The E Division on-site Program Office in Carlsbad, in collaboration with the DOE Carlsbad Area Office, provides a strong combination of facilities and scientific and engineering expertise to address the priority issues of repository science and environmental nuclear materials accountability. This effort includes transparency technologies, collaborative work to identify transparency requirements for repositories, and experimental facilities requiring low levels of background radiation.

CAPABILITIES

Environmental Technology / TRU Waste Characterization - Being first to ship transuranic waste to the Waste Isolation Pilot Plant (WIPP) demonstrated LANL's leadership role in the science and engineering of non-destructive radionuclide assay, transuranic radionuclide characterization, and rigorous waste acceptance criteria certification. By developing state-of-the-art assay and characterization instrumentation, which is portable, LANL has become an essential capability to other DOE sites needing to certify transuranic waste for shipment to WIPP.

Environmental Technology / Actinide Geochemistry - Management of the entire life cycle of nuclear materials from generation to permanent disposal reduces the current and future risk of radioactive waste contamination. In order to optimize disposition systems as a part of next-generation, proliferation-resistant nuclear systems, the Division's capabilities will be leveraged with the Laboratory's capabilities to provide an integrated systems approach employing advanced engineered barrier systems incorporating natural geomaterials, laboratory- and field-scale

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experimental transport studies, and radionuclide transport modeling.

Strategic Focus

The Laboratory has demonstrated its commitment to managing the entire life-cycle of nuclear materials from generation to permanent disposal while understanding and safeguarding the natural environment from a local to global scale. Over the next two decades, billions of dollars will be invested globally in managing nuclear materials and waste, cleaning up the environment, and protecting and restoring the natural environment. To this end, three strategic environmental science program thrust areas are emerging:

- Natural Resources Protection and Restoration;
- Nuclear Waste and Materials Management; and
- Repository Science.

The **Natural Resources Protection and Restoration** thrust illustrates the philosophy of approaching environmental issues at regional, national, and international levels. Environmental restoration and water resource management are the focus for this thrust area. The Laboratory responds to the site-specific science and technology needs for the Environmental Restoration Project (ER) by developing innovative technologies, nurturing applied research, developing scientific foundations for long-term solutions, and demonstrating and deploying technologies. ER site-specific issues include movement of contaminants within watersheds, stabilization of material disposal areas, human health and ecological risk-based cleanup, and protection of surface and ground waters. The Laboratory uses its environmental restoration sites as test beds for the DOE Complex. Laboratory science and technology also support global clean-up with a focus on actinides in the environmental.

The Laboratory contributes its science and technology to regional and statewide water resource policy and administration (e.g., the Governor's Blue Ribbon Task Force on Water and Jemez y Sangre Water Planning Council). At a national and international level, the Laboratory plays a security role in developing technical capabilities to assist decision-making processes relative to environmental issues. Water availability is a global environmental issue for Laboratory customers with strong national security and economic security implications.

The strategy is to use the Laboratory's technical capabilities to model and simulate local and regional hydrogeologic systems within the Upper Rio Grande Basin and then extend these capabilities to understanding water quantity and quality issues in a national security and international stability context. Further, the hydrologic cycle is at the heart of issues surrounding global climate change and carbon management, which allows additional leverage with other Laboratory programs. Activities in water science also leverage on the Laboratory Directed Research and Development (LDRD) Coupled Environmental Modeling Project. Additionally, the Laboratory is also participant in a multinational program in the Middle East designed to build trust between neighboring countries and has been named Secretariat for the US/China Water Resources Management Program, a treaty level activity of the US/China Joint Commission Meeting on Science and Technology.

The **Nuclear Waste and Materials Management** thrust support the Laboratory's commitment to closing the life-cycle for nuclear materials from mining and milling to repository disposition while restoring and safeguarding the environment. The Laboratory's capabilities are used in managing nuclear waste and materials to protect the local and the global environment. Program development activities present a synergy between Laboratory operations and our science and technology capabilities. The Laboratory's nuclear material capabilities are critical to national and international materials management and repository programs. A key Laboratory strategy is to actively promote Laboratory facilities as test-beds for demonstration and validation of emerging environmental science and technologies. A team of Laboratory personnel stationed at DOE's Rocky Flats Environmental Technology Site provides direct technical support in nuclear materials management, waste management, and environmental restoration as site-closure strategies are developed. The program facilitates transfer of Laboratory technology to clean-up of Rocky

Flats. The program is developing size reduction and waste stream disposition projects. Within the DOE Complex, the nuclear materials life-cycle management depends on a system that must transition materials from mission-related activities, prepare them for disposition, certify that they meet waste acceptance criteria, and transport them to either storage or final repository disposition.

The Laboratory is a leader for the science and engineering of non-destructive radionuclide assay, transuranic radionuclide characterization, and rigorous waste acceptance criteria certification. The characterization and certification process developed by this program was the first to be approved by DOE's Carlsbad Area Office (CAO) and the U.S. Environmental Protection Agency. This process is a series of validation and verification steps to ensure wastes meet the strict waste acceptance criteria of the Transuranic Waste Characterization Quality Assurance Program Plan. By developing state-of-the-art assay and characterization instrumentation, which is portable, the Laboratory can transfer this capability to other DOE sites needing to certify transuranic waste for shipment to WIPP.

Through developing and applying science, technology, and engineering, the Laboratory was the first DOE site to begin shipping waste to WIPP. With DOE and others in the Complex, the Laboratory will improve this system through reducing volumes of material shipped and operation costs. Additionally, the Laboratory is providing other DOE sites with technical guidelines for plutonium residues, which mitigate environment, safety, and health vulnerabilities.

The **Repository Science** thrust organizes and transfers Laboratory capabilities that are necessary for developing of long-term disposal of defense and commercial nuclear and transuranic waste. The Laboratory has acquired significant experience and capabilities in repository science through support of the Yucca Mountain Project (YMP), WIPP, and collaboration with several international programs. In addition, the Laboratory has expertise and capabilities in nuclear fuels and reactors, reprocessing technologies, materials science, actinide geochemistry, and non-proliferation, which provide a suite of decision tools and technical capabilities to manage materials at all stages of the nuclear fuel cycle. Customer areas include deep geological disposal facilities, monitored retrievable storage, in-situ disposal, and uranium tailings stabilization.

Life-cycle management of nuclear materials from mining to repository disposition reduces current and future risk of radioactive waste contamination. In order to optimize disposition systems as a part of next-generation, proliferation-resistant nuclear systems, capabilities will be leveraged to provide an integrated systems approach employing advanced engineered barrier systems incorporating natural geomaterials, laboratory- and field-scale experimental transport studies, and radionuclide transport modeling. In an effort to lead the nation in repository science, the Laboratory will provide technical support to develop the Carlsbad Repository Center.

Program Goals

Environmental Restoration

Goal: Execute clean-up activities to protect human health and the environment from future exposure to hazardous, radioactive, and mixed wastes from historical treatment, storage, and disposal practices at the Laboratory.

Strategies and measures:

- Establish streamline contracting process
- Continue strengthening baseline management processes
- All sites are cleaned up or stabilized by 2013

Goal: Facilitate development of innovative technologies for national and international cleanup programs.

Strategies and measures:

- nurture applied research;
- developing scientific foundations for long-term environmental restoration solutions; and
- demonstrating and deploying technologies.

Waste Management/Offsite Source Recovery

Goal: Safe, compliant, and cost-effective work-off of legacy waste presently stored at the Laboratory.

Strategies and measures:

- Ship legacy MLLW with a disposal path to commercial treatment-and-disposal facilities by FY03
- Dispose of site legacy TRU waste to the Waste Isolation Pilot Plant (WIPP) for disposal by FY13.

Goal: Recover actinide-bearing radioactive sources from commercial and governmental radioactive material licensees and other DOE sites.

Strategies and measures:

- develops paths for disposal of sources that do not presently have a disposal path.
- About 10% of these sources are considered eligible for disposal at WIPP.
- accelerate recovery of radioactive sources that are of highest risk to the public,
- store the sources at the Laboratory until a disposal site is available, which is projected for 2006.

Environmental Stewardship Office

Goals:

- Assist the Laboratory to produce zero avoidable waste,
- Facilitate the use of minimum natural resources (especially energy and water) at the site
- Laboratory procures only environmentally preferable products.

Strategies and measures:

- identify Laboratory operations for future environmental improvements;
- reduce the potential for shutdowns and fines, improving productivity by minimizing wastes that are expensive to dispose; and
- demonstrate the Laboratory's commitment to the best environmental practices.
- Expand LANL support for process and system improvements via generator set-aside program Green Zia and other tools.

Environmental Science and Technology

Goal: Deploy technologies that address environmental needs at the Laboratory and elsewhere in the DOE Complex as well as the United States and the world.

Strategies and measures:

- Strengthen partnerships with Environmental Restoration and Waste Management Programs for site demonstrations of innovative technology
- Position Laboratory in leadership role for specific science & technology thrust of prime importance to DOE
- Participate at Division level on DOE-EM50 Core Team, resolving programmatic approach and accountability issues for using science and technology

Environmental Work for Others

Goal: Establish cross-Laboratory competency development for High-Resolution Environmental Studies to allow regional assessments of the impacts of global climate systems.

Strategies and measures:

- Obtain and maintain Secretariat role for State Department international water program
- Continue working “brand” concept to strengthen customer perceptions of LANL for computerized environmental studies

Goal: Facilitate LANL development of environmental technologies for DoD sites addressing unexploded ordnance and other potential contaminants.

Strategies and measures:

- Continue involvement in the joint DoD, DOE, and EPA Strategic Environmental Research and Development Program
- Participate in the DoD Environmental Security Technology Certification Program.

Goal: Maintain active LANL tie to national Green Chemistry programs

Strategies and measures:

- Serve as the lead Laboratory for the EPA’s Green Chemistry Program that is focused on expansion of the international program
- Expand the Green Chemistry Institute, which the Laboratory manages for the EPA,
- Conduct a series of government, industry, Laboratory cooperative research conferences to establish research and funding goals in this area.
- Serve as Secretariat for the CHEMRAWN (CHEMical Research Applied to World Needs) XIV World Conference on Green Chemistry to be held in July 2001.

Nuclear Materials

Goal: provide other sites with technical guidelines for risk-based prioritization, stabilization standards, stabilization processes, packaging for storage of plutonium for possible future use, and surveillance during the storage period.

Strategies and measures:

- Provide technical support for EM Nuclear Materials Stewardship to assure effective management of these materials pending their transfer to the DOE Materials Disposition Program.
- Conduct research for making mixed uranium-plutonium oxide reactor fuel.

Yucca Mountain Program

Goal: Maintain leadership role in developing key technical documents associated with permitting YMP facility.

Strategies and measures:

- Continue management role within science and technology portion of M-K organizational structure
- Leverage actinide geo
- In close coordination with other national laboratories, maintain arms’ length relationship during YMP M&O contract negotiations

Goal: Continue technical support for site characterization and field-testing.

Strategies and measures:

- Demonstrate on-going ability to perform high quality work in timely manner.
- Maintain rigorous cost estimating process for project to keep programmatic expectations in alignment with funds available.

Carlsbad Repository Center

Goal: Lead efforts in establishing certification programs for the disposition of nuclear materials at nine other DOE sites.

Strategies and measures:

- Establish an on-site program (in Carlsbad) in collaboration with CAO
- Develop experiments and projects for transportable TRU-Waste Loading Systems, and Mobile Visual Examination and repackaging systems for deployment and Mobile Authorization Basis

Goal: Establish an on-site Center in Carlsbad in collaboration with Sandia National Laboratories and CAO.

Strategies and measures:

- Identify transparency requirements for repositories and developing experimental facilities that require low levels of background radiation.
- Establish experimental facilities requiring low levels of background radiation.
- Provide an integrated systems approach employing:
 - advanced engineered barrier systems incorporating natural geomaterials;
 - laboratory- and field-scale experimental transport studies;
 - underground characterization using geophysical and micro-drilling techniques;
 - radionuclide transport modeling;
 - advanced monitoring/safeguards technologies; and
 - performance assessment/decision support tools.

Capability Goals

Actinide Geochemistry

Goal: Maintain experimental nature of efforts with strong emphasis on application to specific national and international problems.

Strategies and measures:

- Continue leveraging combination of laboratory and field experimentation on specific problems
- Develop chemistry of unknown actinide transport processes that pose potential risk to human health and environment
- Apply understanding of actinide geochemistry to the engineering of improved repositories and the development of environmental remediation barriers.

Repository and Barrier Engineering

Goal: Develop the technology to improve the radionuclide containment of nuclear waste repositories that can have a dual use as containment barriers for environmental remediation sites.

Strategies and measures:

- Develop permeable containment barriers to assist remediation and long term monitoring of contaminated land
- Utilize lessons learned on contaminant transport processes to build “traps” for contaminants that allow benign material to pass
- Establish modeling capability in partnership with ER project to predict the effectiveness of various barrier technologies on a variety of contaminants.
- Identify and develop marketing strategies for other potential sponsors such as the Department of Defense

Waste Disposal and Certification

Goal: Expand TWCP program to integrate multiple technologies into a single effort that meets several regulatory requirements.

Strategies and measures:

- Work closely with RFETS and INEEL to identify technical and regulatory requirements for waste shipment
- Continue working with NMED to streamline and simplify regulatory reporting requirements while ensuring safe, compliant program
- Leverage concerns related to fire and waste stored on site to re-engineer LANL TWCP activity

Waste Characterization Technology

Goal:

Strategies and measures:

Waste, Environmental, and Systems Engineering

Goal: Establish use of RAMROD space for medium and large projects that support engineering capability while encouraging tighter coupling with needs and capabilities of NMT at TA55.

Strategies and measures:

- Develop training strategy for technicians working on projects to enhance E-ET's ability to provide a value added technical contribution to these projects.
- Explore viability of "Flibe-Tritium" project (supports fusion reactor first-wall development)

Operational Goals

Infrastructure Goals: After completing security upgrades this year, E-Division will direct its infrastructure goals to streamlining operations and administratively tightening administrative security controls. The division will also continue to support ALD/SSR activities related to upgrading and improving such facilities as TA48 RC-1. The following describes specific division goals.

Goal: Improve E-ET utilization of TA50 highbay space.

Strategies and measures:

Develop complementary suite of projects staged by size and timing for space. These may include a “Flibe-Tritium” project.

Goal: Reduce the costs of characterizing and preparing waste for shipment to WIPP.

Strategies and measures:

- Leverage regional concern about waste storage and institutional support for re-engineering systems and deploying new technologies to increase the quantity of waste that the Laboratory can ship by significantly reducing the cost.
- Continue developing and implementing re-engineering efforts that benefit Los Alamos as well as other sites planning to ship waste to WIPP

Goal: Continue implementing institutional security and ISM requirements.

Strategies and measures:

- Maintain dedicated resources to developing ISM tools for staff.
- Continue implementation of communications plan
- Establish formal quarterly security walkdown

Workforce Goals: E-Division supports the workforce goals of the institution including affirmative action and equal employment opportunities. As both a capability organization and program office our workforce goals include strengthening our science base while staffing new programmatic opportunities.

Goal: Complete the transition of appropriate limited-term, contractor and student staff into long-term permanent UC positions.

Strategies and measures:

- Demonstrate rigor of HR management in division by completing and executing five year staffing plan.
- Align strategic workforce programs through a review of the student and post-doc programs.

Goal: Develop appropriate job and salary levels for project controls staff.

Strategies and measures:

- Work with both HR and PM Divisions to evaluate PPC positions.
- Benchmark salaries and demands with compensation staff in HR

Goal: Stabilize staffing for both Carlsbad and Rocky Flats activities.

Strategies and measures:

- Participate in other sites' planning efforts
- Shift resources as appropriate between sites and TWCP program at Los Alamos
- Develop long-term recruiting strategy in Carlsbad

Goal: Maintain diverse workforce providing equal opportunity for all.

Strategies and measures:

- Maintain and promote action oriented plan as division-wide tool
- Review AA/EEO statistics with management
- Continue implementation of communication plans
- Continue support for WERC and other education programs to build long-term employment opportunities for students at LANL

Community Relations Goals: E-Division will continue to participate in work around the region that furthers the sustainability of the region both economically and environmentally. We will do this by achieving the following goals.

Goal: Maintain active role in partnership with others in the region to address specific problems in region.

Strategies and measures:

- Continue leadership roles in the Governor's Blue Ribbon Task Force on Water and regional water planning
- Leverage Laboratory's participation in State's Green Zia Environmental Excellence program to improve credibility in region
- Maintain active role in Vision Los Alamos 2020 group during community rebuilding program

Goal: Improve effectiveness of Environmental Restoration's community relations in conjunction with institutional efforts to engage the community regarding Laboratory operations.

Strategies and measures:

- Encourage institutional development of a large-scale GIS system to improve communications with stakeholders.
- Strengthen institutional approach to managing the natural resources (air, groundwater, surface water, soils, and biota) to demonstrate a coherent approach to neighbors.
- Continue improving relationship with and effectiveness of Citizens' Advisory Board activities.

Financial Goals: E Division will continue to operate its programs using state of the art financial and project control systems. These systems will continue to demonstrate the high value-added service provided by the University of California to DOE. Attached to this plan are funding table from the Institutional Plan, LDRD estimates for the current year and next two, as well as current allocation matrixes. These documents show the major sponsors and collaborators in the area of environmental programs.

Goal: Maintain funding profiles as planned in current ER and WM baselines and reflected in table above

Strategies and measures:

- Continue demonstrating effective baseline development and management.
- Focus on results that are important to DOE customer
- Publish results to maintain strong stake-holder support (and therefore the support of the congressional delegation)

Goal: Continue to effectively utilize make-buy criteria to assure appropriate outsourcing activities to sub-contractors.

Strategies and measures:

- In partnership with BUS, improve procurement process and timeliness.
- Proactively engage DOE in discussing make-buy opportunities.
- Maintain defensible baselines for ER and WM that “justify” internal vs. external activities.

Goal: Grow new programs in TRU Waste Management, Offsite Source Recovery, Water Resources Management, and Nuclear Materials Focus Area activities.

Strategies and measures:

Please refer to the specific goals and strategies described above in the “Program” section.